An HL7 Toolkit

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The Clinical Information System (CIS) developers at the Columbia-Presbyterian Medical Center (CPMC) have chosen Health Level 7 (HL7) as the standard for exchanging health care data. At CPMC, there is a typical mix of in-house developed applications and vendor supplied applications. It has been possible to get vendors to develop and deliver HL7 interfaces. The software tools they use to create these interfaces is of little import to CPMC, as long as there is an acceptable price per interface. However, with regard to in-house developed applications, in order to decrease overall development costs, we felt the need to make available a software toolkit for encoding and decoding HL7 messages.

HL7 is an application protocol for electronic data exchange in health care environments. The primary goal of the standard is to provide for the exchange of data among health care computer applications. This eliminates or substantially reduces the custom interface programming and program maintenance that is required. The HL7 standard defines the messages as they are exchanged among applications entities and the protocols used to exchange them. As such, it conceptually operates at the seventh level of the ISO model for Open Systems Interconnection (OSI). According to this model, the HL7 Standard simply defines the data elements that are exchanged as abstract messages, and does not prescribe the exact bit stream representation of the messages that flows over the network. Lower level network software developed according to the OSI model may be used to encode and decode the actual bit stream. However, the ISO protocols are not universally implemented and therefore, to facilitate the use of HL7, a set of encoding rules for defining the exact representation of a message are also specified. To make use of these encoding rules application programmers have to directly encode and decode HL7 messages that are constructed using the HL7 encoding rules.

With the goal of facilitating the use of HL7, we have developed a software toolkit for implementing the HL7 encoding rules. An application programmer writing programs in the C language uses a set of procedures to manipulate data structures. The procedures isolate the programmer from having to know the details of the HL7 encoding rules. Our principle objective is to allow the programmer to deal with the HL7 messages as was intended, i.e., abstract messages and the programming level.

The procedures in the toolkit are grouped functionally as follows: memory management, bit stream to/from structure conversions, segment/structure manipulation and navigation, and field/component/repetition specification and extraction. To construct an HL7 message, a programmer allocates and creates a linked list structure, inserting various segment structures that are needed in the message. For each segment, individual fields are then filled in. Only the individual fields that are required need be filled in. Procedures exist for creating components and subcomponents, and repetitions. Finally, using the structure to bit stream conversion procedure an HL7 encoded message is created. This string may be submitted to any transport protocol for transmission across the network. A similar but reverse set of methods exists for extracting application specific data from an incoming HL7 message.

The current release of the software library is available as freeware over the Internet via anonymous ftp and from the HL7 organization. The code is portable to a variety of operation systems, including UNIX variations, VMS, OS/2, DOS, and Macintosh OS.

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